

Community Participation in the Management and Maintenance of Urban Drainage Systems in Sungai Penuh City as a Flood Mitigation Effort: A Case Study of Jl. M.H. Thamrin (Simpang Tiga Rawang Village, Hamparan Rawang District)

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ABSTRACT

Flooding is a natural phenomenon that frequently occurs in Indonesia, especially during the rainy season. In Sungai Penuh City, drainage blockage due to poor maintenance is also one of the causes of flooding. Drainage systems are often not well-maintained due to the government's budget constraints. Community participation in drainage maintenance activities is expected to serve as an alternative solution to minimize flood risks. Therefore, this study was conducted to examine the drainage management and maintenance system, the level of community participation in drainage maintenance activities, and recommended solutions to optimize community involvement in drainage maintenance. The study was conducted on Jl. M. H. Thamrin, Simpang Tiga Rawang Village. The assessment indicators for community participation levels were based on the Indonesian Ministry of Public Works Regulation No. 12/Prt/M/2014 concerning the Implementation of Urban Drainage Systems. This research employed a combination of quantitative and qualitative methods. The qualitative method involved interviews with informants, while the quantitative method utilized a Likert-scale questionnaire assessment for 90 households. The results indicate that out of six assessment indicators, four show that community participation in drainage maintenance remains low (below 40%). However, two indicators demonstrate active community participation, namely the prevention of building construction over drainage channels (76.67%) and reporting information to the government (57.70%). The recommended alternative solutions to enhance community participation include increasing public education through socialization, enforcing regulations and sanctions, and encouraging local communities to actively mobilize residents in self-sustained drainage maintenance efforts.

INTRODUCTION

Flooding is a natural disaster that frequently occurs in Indonesia, especially during the rainy season. Continuous drainage blockages caused by poor maintenance are one of the main contributors to flooding. Therefore, a maintenance policy system is needed that can automatically adjust its scheduling strategy in line with local environmental changes (Chen et al., 2016). Situngkir et al. (2016) revealed that limited drainage capacity due to small dimensions and poor maintenance—such as solid waste deposits, weeds, and sedimentation—contributes to the occurrence of floods. Febrianti (2019), in her research, emphasized that to ensure proper maintenance, one of the strategies that must be implemented is conducting routine maintenance activities, such as community service involving both the government and the local community.

Urban flooding can result from various factors. Arifin (2018) and Badarudin (2021) stated that blockages caused by waste and sedimentation hinder the optimal flow of water. Additionally, population growth leads to increased development areas, resulting in land use changes, which also contribute to flooding, as noted by Prawati (2021) and Arisma (2022). Furthermore, community activities, including construction near or on drainage channels and river border areas, also increase the risk of flooding due to river narrowing and sediment accumulation (Riyanto, 2022).

Community participation in drainage maintenance is expected to serve as an alternative solution to minimize flood risk. Involving the public in the management and maintenance of drainage systems has many advantages—for the community itself, the government, and the environment. These include improving the effectiveness of drainage channels, reducing maintenance costs, raising environmental awareness, fostering a sense of responsibility, and enhancing public health.

Mulya et al. (2021) stated that the influence of physical aspects, such as drainage network quality, network capacity, and water pooling, showed a positive coefficient, although not statistically significant. This indicates that although the drainage network's physical condition may be adequate, poor maintenance and blockages prevent smooth

water flow into the primary channels. This highlights the significant impact that proper maintenance has on drainage performance. Hence, a high level of community involvement is expected to ensure optimal drainage function.

In Sungai Penuh City, the operation and maintenance of urban drainage systems fall under the responsibility of the Public Works and Spatial Planning Agency (Dinas PUPR). These activities are part of the sub-activity plan for the Operation and Maintenance of Drainage Systems. One of the key initiatives by Dinas PUPR in Sungai Penuh City is the establishment of a Drainage Task Force, whose duties include regularly cleaning the drainage channels.



Figure 1. The Drainage Task Force Conducts Routine Maintenance

Source : Documentation of maintenance activities by the Spatial Planning Division, DPUPR Sungai Penuh City, 2025

In practice, the operation and maintenance of drainage systems cannot be fully delegated to the responsibility of the district/city government. Considering the limitations of available resources, cooperation among various stakeholders is necessary to maintain and preserve existing infrastructure facilities. In the area of Jl. M. H. Thamrin, Simpang Tiga Rawang Village, Hamparan Rawang District, drainage maintenance is carried out by the Spatial Planning Division of the Public Works and Spatial Planning Agency (DPUPR) of Sungai Penuh City. However, limited maintenance funds and low community participation have resulted in suboptimal drainage function due to blockage materials.

Raising public awareness in maintaining public facilities such as drainage through the implementation of clean living habits is essential for ensuring optimal drainage function. For example, avoiding the disposal of garbage and waste into the drainage system is critical, as it leads to blockages. In addition, untreated household wastewater can have negative environmental and ecological impacts (Sufra, R. et al., 2024). For these reasons, the researcher is interested in studying the level of community participation in drainage maintenance and recommending solutions to optimize public involvement.

Participation

According to Keith Davis, as cited by Puji Hadiyanti (2023), participation is the mental, emotional, or moral involvement of an individual in group situations that encourages them to contribute to the group's efforts toward achieving goals and to take responsibility for those efforts. According to Adi (2007), participation means the active involvement of the community at various stages of communal life. This involvement may include contributions in thought and physical effort, utilizing their potential (initiative) in carrying out activities, supporting goal achievement, and taking responsibility for their participation (Astuti, 2009).

Community Participation in Drainage Management and Maintenance

Based on the Regulation of the Ministry of Public Works of the Republic of Indonesia No. 12/Prt/M/2014 on the Implementation of Urban Drainage Systems, Article 31, community participation in the management and maintenance of drainage systems may include:

1. Providing infiltration wells, retention ponds, and water storage ponds according to the area's characteristics
2. Preventing waste and wastewater from entering drainage channels
3. Conducting maintenance and cleaning of local drainage in the surrounding environment
4. Preventing the construction of buildings over drainage channels and inspection roads
5. Managing local drainage systems independently
6. Reporting drainage-related issues to district/city governments

In disaster management, community involvement becomes a crucial element because the government's capacity alone is relatively limited compared to the magnitude of the challenges. Community roles in disaster handling can take various forms, such as volunteering in the field and contributing expertise (Awaliyah et al., 2014). Azwarman (2022) stated that the lack of discipline in waste disposal by the community into streets and drains can cause blockages, leading to flooding. Community participation in urban drainage management can be applied at every stage, from planning, construction implementation, operation, maintenance, to monitoring and evaluation. Communities actively involved in drainage management have great potential to identify issues, design solutions, and implement effective preventive actions.

METHODS

The research location was selected based on areas frequently affected by flooding. The chosen location is the drainage system on Jl. M. H. Thamrin, Simpang Tiga Rawang Village, Hamparan Rawang District. This research used a mixed-method approach, combining qualitative and quantitative methods. The selection of this approach was based on data sources, which included interviews and questionnaires. Interviews were conducted with individuals directly involved in drainage maintenance activities on Jl. M. H. Thamrin. Meanwhile, questionnaires were distributed to households around the research area. The number of questionnaires was determined using proportionate stratified random sampling. The sample size was calculated using Slovin's Formula (Sarjono, 2011). Out of 854 households, a sample size of 89.52 was obtained and rounded to 90 households.

Identification of the Drainage Management and Maintenance System

The data analysis was conducted using qualitative methods. The analysis was based on interviews with key informants, namely the Commitment Making Officer (PPK/KPA) for Drainage Management Activities, the Technical Activity Implementation Officer (PPTK) for Drainage Maintenance, and community leaders. The data analysis process is illustrated in the following figure:

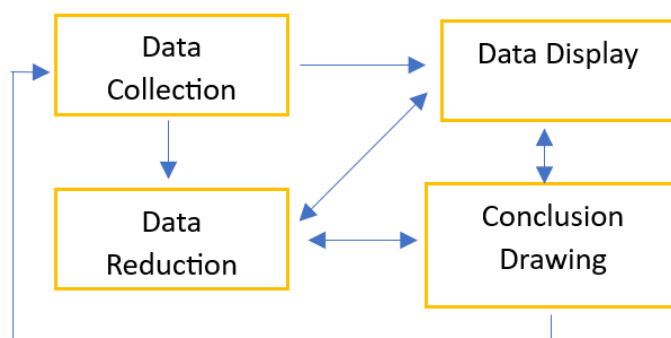


Figure 2. Qualitative Research Data Analysis Process

Source : Ahmad (2021)

Identification of Community Participation in Drainage Management and Maintenance Efforts

The data analysis conducted was quantitative. It was based on the results of a weighted Likert scale questionnaire distributed to 90 households. Before distributing the questionnaire, the researcher conducted expert validation for each question. As a result of the expert validation, 18 out of 30 questions were selected. The questions were based on six indicators of community participation as outlined in Article 31 of the Regulation of the Ministry of Public Works of the Republic of Indonesia No. 12/Prt/M/2014 concerning the Implementation of Urban Drainage Systems. The weighting calculation was performed using the Likert scale to determine the percentage level of community participation in drainage management and maintenance activities.

Determining Solutions or Recommendations to Optimize Community Participation in Drainage Management and Maintenance

The data analyzed were obtained from interviews and previously conducted questionnaires. A SWOT analysis was then used to determine recommended solutions to optimize community participation in drainage maintenance. The SWOT analytical framework served as the basis for formulating sustainable strategic recommendations (Viareco, H. et al., 2024).

RESULT

Identification of Drainage Management and Maintenance System

Based on interviews with three (3) informants, the following results were obtained:

Table 1. Weighted Analysis of Informant Interview Results

NO	STATEMENT	SCORE
1.	The physical condition of the drainage system is relatively good, but there are still blockage materials (waste and sediment), and flooding occurs during the rainy season.	3/3 *100% = 100 %
2.	There is no supporting infrastructure such as infiltration wells, retention ponds, or water storage ponds	3/3 *100% = 100 %
3.	The obstacles in implementing infiltration wells or retention ponds include limited land availability, high costs, and a lack of public understanding.	3/3 *100% = 100 %
4.	Most residents still dispose of garbage and household waste into the drainage channels.	3/3 *100% = 100 %
5.	Preventive measures taken include the construction of closed drainage channels and public awareness campaigns on waste management by the Environmental Agency and Disaster Management Agency	1/3 *100% = 33,33 %
6.	Awareness of regulations that support the prevention of waste and wastewater from entering drainage systems (Regional Regulation No. 2 of 2024 concerning Spatial Planning 2024–2044, Article 56 Paragraph 7c)	2/3 *100% = 66,67 %
7.	Drainage maintenance activities are carried out by the Spatial Planning Division of DPUPR Sungai Penuh City by establishing a drainage task force that routinely cleans drainage channels. However, community participation remains low.	3/3 *100% = 100 %
8.	There are no buildings constructed over drainage channels.	3/3 *100% = 100 %
9.	Active community participation in drainage maintenance is essential to ensure smooth water flow and reduce flood risk.	3/3 *100% = 100 %

Source : Data Processing Result (2025)

Identification of Community Participation in Drainage Management and Maintenance

The distributed questionnaire consisted of 6 assessment indicators with a total of 18 questions. The six indicators are described as follows:

1. Provision of Infiltration Wells, Water Storage Ponds, and Retention Ponds According to Area Characteristics
 Respondents' responses to the indicator on the provision of infiltration wells, water storage ponds, and retention ponds according to the characteristics of the area are presented below:

Table 2. Questionnaire Results for Indicator 1

Provision of Infiltration Wells, Water Storage Ponds, and Retention Ponds According to Area Characteristics					
Answer	SA	A	N	D	SD
Score	5	4	3	2	1
Total answer	0	17	54	106	93

Source : Data Processing Result (2025)

Based on the table above, the percentage of community participation was calculated

$$= \frac{(5*0)+(4*17)+(3*54)+(2*106)+(1*93)}{(90*5)*3} \times 100 \%$$

= 39,63 % (Non-Participative)

2. Preventing waste and wastewater from entering drainage channels
 Respondents' responses to the indicator on the preventing waste and wastewater from entering drainage channels are presented below :

Table 3. Questionnaire Results for Indicator 2

Preventing waste and wastewater from entering drainage channels					
Answer	SA	A	N	D	SD
Score	5	4	3	2	1
Total answer	6	12	51	104	97

Source : Data Processing Result (2025)

Based on the table above, the percentage of community participation was calculated
$$= \frac{(5*6)+(4*12)+(3*51)+(2*104)+(1*97)}{(90*5)*3} \times 100\%$$

$$= 39,70\% \text{ (Non-Participative)}$$

3. Conducting maintenance and cleaning of local drainage in the surrounding environment

Respondents' responses to the indicator on the Conducting maintenance and cleaning of local drainage in the surrounding environment are presented below :

Table 4. Questionnaire Results for Indicator 3

Conducting maintenance and cleaning of local drainage in the surrounding environment					
Answer	SA	A	N	D	SD
Score	5	4	3	2	1
Total answer	2	5	56	111	96

Source : Data Processing Result (2025)

Based on the table above, the percentage of community participation was calculated
$$= \frac{(5*2)+(4*5)+(3*56)+(2*111)+(1*96)}{(90*5)*3} \times 100\%$$

$$= 38,22\% \text{ (Non-Participative)}$$

4. Preventing the construction of buildings over drainage channels and inspection roads

Respondents' responses to the indicator on the Preventing the construction of buildings over drainage channels and inspection roads are presented below :

Table 5. Questionnaire Results for Indicator 4

Preventing the construction of buildings over drainage channels and inspection roads					
Answer	SA	A	N	D	SD
Score	5	4	3	2	1
Total answer	31	180	42	17	0

Source : Data Processing Result (2025)

Based on the table above, the percentage of community participation was calculated
$$= \frac{(5*31)+(4*180)+(3*42)+(2*17)+(1*0)}{(90*5)*3} \times 100\%$$

$$= 76,67\% \text{ (Participative)}$$

5. Managing local drainage systems independently

Respondents' responses to the indicator on the Managing local drainage systems independently are presented below:

Table 6. Questionnaire Results for Indicator 5

Managing local drainage systems independently					
Answer	SA	A	N	D	SD
Score	5	4	3	2	1
Total answer	0	5	55	92	118

Source : Data Processing Result (2025)

Based on the table above, the percentage of community participation was calculated
$$= \frac{(5*0)+(4*5)+(3*55)+(2*92)+(1*118)}{(90*5)*3} \times 100\%$$

$$= 36,07\% \text{ (Non-Participative)}$$

6. Reporting drainage-related issues to district/city governments

Respondents' responses to the indicator on the Reporting drainage-related issues to district/city governments are presented below:

Table 7. Questionnaire Results for Indicator 6

Reporting drainage-related issues to district/city governments					
Answer	SA	A	N	D	SD
Score	5	4	3	2	1
Total answer	14	49	119	68	20

Source : Data Processing Result (2025)

Based on the table above, the percentage of community participation was calculated
$$= \frac{(5*14)+(4*49)+(3*119)+(2*68)+(1*20)}{(90*5)*3} \times 100 \%$$
$$= 57,70 \%$$
 (Sufficiently participative)

Recommended Solutions to Optimize Community Participation in Drainage Management and Maintenance

Based on the results of interviews and questionnaire weighting, the recommended solutions to optimize community participation in drainage management and maintenance were obtained using the SWOT method. The results suggest that the solutions include increasing education through socialization to the community about the importance of maintaining cleanliness and the function of drainage, enforcing rules and sanctions for those who dispose of waste into the drainage system, and encouraging local communities to play a more active role in drainage maintenance.

DISCUSSION

The data processing from interviews on the identification of the drainage management and maintenance system on Jl. M.H. Thamrin, Simpang Tiga Rawang Village, shows that the level of community participation in drainage maintenance activities is still low. This is evident from the fact that some people dispose of waste and trash into the drainage channels. Drainage maintenance activities are only carried out by the government, in this case, the Public Works and Spatial Planning Department (DPUPR) of Sungai Penuh City through the Spatial Planning Division by forming a drainage task force team that is responsible for regularly cleaning the drainage systems.

In line with the results from the questionnaire data processing with 6 indicator assessments, the community's participation in drainage management is still low, except for preventing construction on top of drainage channels and communicating information about drainage management to the government. The main challenges are the lack of awareness, limited land and financial resources, as well as the diminishing practice of mutual cooperation (gotong royong). To increase involvement, further education and encouragement from the government and local communities are needed to make the people more concerned about their environment.

Therefore, several recommended solutions are required to optimize community participation in drainage maintenance, such as:

1. Increasing public education about the importance of clean and properly functioning drainage systems.
2. Enforcing stricter rules and sanctions for violators who dispose of waste into drainage systems.
3. Making it easier for the public to report drainage issues with a more responsive system.
4. Encouraging local communities to take a more active role in drainage maintenance.

CONCLUSION

The results of interviews with informants indicate that the level of community participation in drainage maintenance activities is still low. This is evident from the fact that some people dispose of waste and trash into the drainage channels. Efforts to prevent this include the construction of closed drainage systems and socialization activities. Meanwhile, drainage maintenance activities are only carried out by the government, in this case, the Public Works and Spatial Planning Department (DPUPR) of Sungai Penuh City through the Spatial Planning Division.

Based on the questionnaire results from 90 respondents, the level of community participation in the management and maintenance of the Jl. M. H. Thamrin drainage system in Simpang Tiga Rawang Village, Hamparan Rawang District, is still low (below 40%), except in terms of preventing the construction of buildings on top of drainage systems (76.67%) and reporting drainage issues to the government (57.70%).

The recommended solutions to optimize community participation in the management and maintenance of the Jl. M. H. Thamrin drainage system in Simpang Tiga Rawang Village, Hamparan Rawang District, include education, enforcement of regulations, and a cooperation program between the government and the community.

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